Message

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Subject: Car & Driver blog from Fuel Economy Detroit - "Whatever Regulators Decide, Engineers Still Focus on Improving Fuel Efficiency"

I saw this over the weekend, though it's a few weeks old now.

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http://blog.caranddriver.com/whatever-regulators-decide-engineers-still-focus-on-improving-fuel-efficiency/

Whatever Regulators Decide, Engineers Still Focus on Improving Fuel Efficiency

APRIL 21, 2017 AT 12:37 PM BY DON SHERMAN

Timing isn't everything, although it often determines the way complex issues pan out. In January, the EPA hurriedly completed its midterm review of 2021–2025 fuel-economy standards 15 months ahead of deadline, beating President Donald J. Trump to office. The inevitable White House reaction followed on March 15: orders to resume the process with the original April 2018 deadline back in force. Ironically, Trump toppled the regulatory apple cart at an Ypsilanti, Michigan, appearance the day before engineers were to convene mere miles away in Dearborn to ponder fuel-economy "megatrends."

Car and Driver attended the Fuel Economy Detroit conference, hosted by publication *Automotive Megatrends*. We conducted interviews, monitored the panel discussion and most of the presentations, and took advantage of Q&A opportunities to bring you the observations that follow. Bottom line: The scope of responsibilities shouldered by the engineers huddled at this Dearborn, Michigan, conference extends far beyond keeping their cars and trucks compliant. This group must also apply its creativity to far-reaching marketing, business, cultural, political, and global competitiveness issues. Another chapter of the regulatory story starts here.

Advanced Technology Drives Fuel-Economy Gains

William Charmley, the EPA's director of the assessment and standards division—who says he's waiting with everyone else to hear what the standards reassessment process yields—was generally optimistic. He reported a steady rise in fuel efficiency since 2004 and satisfying gains in most categories, such as 33 percent better mileage among truck-based SUVs. Overall powertrain efficiency has climbed by more than 5 percent since 2012, he said. Citing a National Academy of Sciences study, the EPA expects the existing 2025 standards can be met by 75 percent of the fleet with advanced-technology gasoline engines at an added cost of $875 per vehicle. Estimating $3.25 per gallon for fuel, Charmley stated that the higher fuel efficiency driven by regulations would save each owner $1650 in operating costs. Your actual prices may vary.

Many presenters supported that theory by touting the advanced technology that's currently spreading throughout the new-vehicle fleet: smaller-displacement boosted engines, direct fuel injection that is sometimes combined with port injection, stop/start, cylinder shutdown, variable valvetrains, Atkinson and Miller cycles, variable-geometry turbochargers, and electrically driven superchargers. Honeywell engineer Geoff Duff courageously noted that, contrary to some evidence, diesel is definitely not dead, especially in large crossovers and trucks. More than a century of internal-combustion development got us this far, and most engineers believe that engines updated with the latest advancements will still dominate in 2025.

John Juriga, one of the panelists and the powertrain director at Hyundai Kia America Technical Center (HATCI), noted that his brands already offer customers a broad range of alternative-propulsion technologies, starting with hybrids and including plug-in hybrids, battery-electric cars, and a fuel-cell car in California. He also pointed out that customers don't buy powertrains but, rather, select complete vehicles deemed most suitable for their wants and needs. Complying with whatever standards the government imposes must be balanced with meeting—and when possible exceeding—market demands.

Ben Schlimme, Toyota's manager of advanced planning and research, recalled the patient nurturing required to make the Prius the most successful hybrid to date. Advancing the alternative-powerplant trend with plug-ins and fuel-cell cars took additional patience and a decade or more of infrastructure investments, such as home and public battery charge points and, in California, a network of hydrogen refueling pumps. While Toyota, like everyone else, is implementing lightweight construction, the

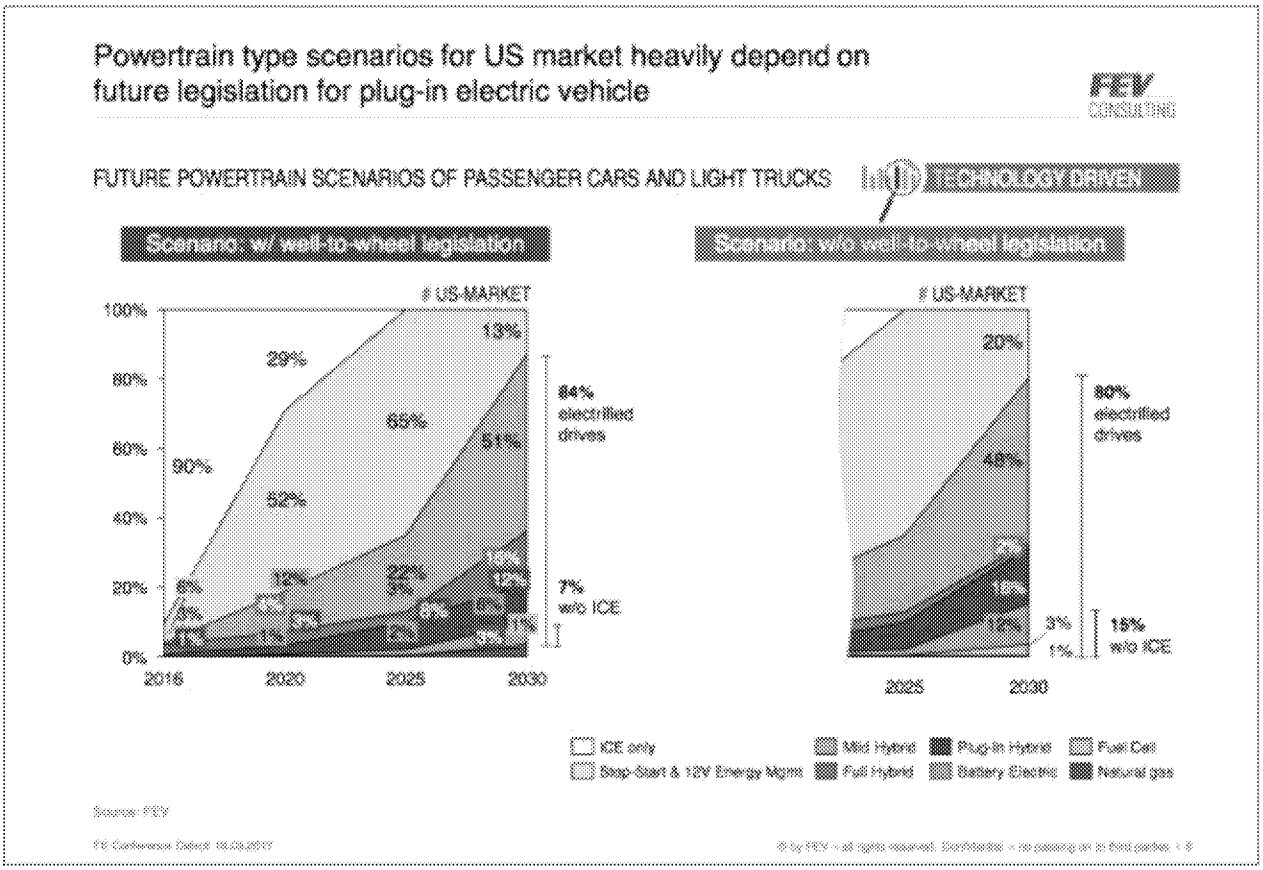
safety implications in such moves warrant due consideration. That concern also applies to convenience possibilities such as wireless battery charging.

An interesting piece of news reported by Ricardo vice president Mark Christie is a move out of the laboratory and onto the road to demonstrate emission-control and mileage claims in real-world conditions: through traffic, up and down grades, and with different driving styles in play. This began in Europe, with Peugeot the first to share Co2 results measured on the road with its customers. In response to the VW diesel scandal, both the EPA and carmakers have also begun investigating over-the-road emission measurements on vehicles sold here.

The Challenge of Greenhouse-Gas Compliance

Per U.S. Supreme Court mandate, the EPA began regulating greenhouse gases (GHG), which are primarily Co2, in 2011. Essentially, this grams-per-mile measure is mpg turned upside down. By definition, the 25 mpg achieved by the average U.S. vehicle is equivalent to 355 grams of Co2 per mile traveled.

Hyundai fuel-economy development engineer Steven Sherman painted a less rosy portrait of compliance in GHG terms, at odds with the EPA point of view voiced by Charmley. While the industry outperformed the GHG standard for the fourth consecutive year in 2015 by a wide margin, most manufacturers could only do so by resorting to flexible-fuel-vehicle (FFV) credits—which expired after 2016. Only five Japanese brands and Tesla met their 2015 GHG obligations on the EPA city and highway test cycles without drawing on credits available for FFVs and special efficiency technologies that don't show up in standard EPA mileage tests.



While electrified powertrain technologies are the most attractive means of boosting advanced internal-combustion powertrains over the 2025 goal line, consumer adoption rates are frustratingly low. A study by industry consultant FEV reported by Alexander Nase (a graphic from his presentation is above) noted that only 84,000 battery-electrics were sold last year in a 17.4-million-vehicle market, and the full range of electrified cars and trucks is stuck at a 3 percent share. Worse, FEV's total cost of ownership study concluded that a gallon of gasoline would have to cost $5.70 for a 2025 plug-in hybrid to top conventional internal-combustion alternatives benefiting from projected improvements. Nase revealed that battery-electrics weren't included in this research because they're even less competitive on total cost of ownership.

Studies by the U.S. Auto Alliance and Novation Analytics cited by Sherman also counter the EPA view expressed at this conference, concluding that "significant adoption of electrified powertrains—including hybrids, plug-in hybrids, battery-electrics, and fuel-cell electrics—will be essential to meet the current greenhouse-gas regulations." GHG reductions averaging 2 percent per year from 2004 through 2013 aren't nearly enough, according to Sherman; twice that amount will be needed to achieve current 2025 goals.

> *"Significant adoption of electrified powertrains—including hybrids, plug-in hybrids, battery-electrics, and fuel-cell electrics—will be essential to meet the current greenhouse-gas regulations."*
> *– U.S. Auto Alliance and Novation Analytics studies*

The hope on the horizon, beyond relaxed regulations and $5.70-per-gallon gasoline, may be disruption. Three currently growing technological trends cited by Sherman have the potential to accelerate EV adoption: cars that are automated, connected, electrified, and shared by multiple owners.

Looking back to the dawn of automotive time to support his disruption theory, Sherman presented this grim forecast printed in an 1894 London *Times* article, "In 50 years, every street in London will be buried under nine feet of manure." Two period photos in his presentation portrayed New York City Fifth Avenue traffic. A 1900 shot revealed a single automobile surrounded by heavy horse-drawn-buggy traffic. That ratio was reversed in a 1913 photo showing only one remaining horse-drawn conveyance, surrounded by a throng of horseless carriages. Looking beyond 2025, Sherman cited former Saudi oil minister Sheikh Yamani, who said, "The Stone Age came to an end not for a lack of stones, and the oil age will come to an end not for a lack of oil."

With future regulations under review, disruption is the operative word. To reach 2025 standards currently on the books, there's little doubt that electrified technology will be essential for a significantly greater share of our transportation fleet. But now that President Trump, a known climate-change skeptic, has thoroughly disrupted the rulemaking process, our crystal ball is cloudier than a tailpipe blowing coal.